UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/721,596	11/25/2003	Robert L. Fair	112056-0145	6032

24267 7590 03/30/2007
CESARI AND MCKENNA, LLP
88 BLACK FALCON AVENUE
BOSTON, MA 02210

EXAMINER	
AHLUWALIA, NAVNEET K	
ART UNIT	**PAPER NUMBER**
2166	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/30/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/721,596	FAIR, ROBERT L.	
	Examiner	Art Unit	
	Navneet K. Ahluwalia	2166	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 January 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18,29 and 30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18,29 and 30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is in response to the Amendment filed January 3, 2007.

Response to Arguments

2. Claims 1 – 18, 29 and 30 are pending in this Office Action and claims 19 – 28 have been cancelled. After a further search and a thorough examination of the present application, claims 1 – 18, 29 and 30 remain rejected.

3. Applicant's arguments filed with respect to claims 1 – 18, 29 and 30 have been fully considered but they are not persuasive.

***First**, Applicant argues that there is no teaching in Lev Ran of receiving a client read request at the storage system... determining whether the received client read request matches any of a plurality of readset data structures...performing readahead operations in accordance with a set of readahead metadata stored in a readset that is determined to match the received client read request.*

In response to Applicant's argument, the Examiner submits that Lev Ran teaches receiving a client read request at the storage system, the client read request indicating client-requested data for the storage operating system to retrieve from a file, directory, vdisk or lun stored in the storage system (receiving a read request and retrieving the information from the file server is clearly explained in paragraph 0328, Lev Ran); determining whether the received client read request matches any of a plurality of readset data structures ("readsets") allocated for the file, directory, vdisk or lun

containing the client-requested data (determining whether the information matches the read request is explained in paragraphs 0328 and 0247 – 0248, Lev Ran); and performing readahead operations in accordance with a set of readahead metadata stored in a readset that is determined to match the received client read request (the readahead or the pre-positioning of the metadata is explained in paragraphs 0290 and 291, also explained in paragraphs 0296 – 0298, Lev Ran).

Other claims recite the same subject matter and for the same reasons as cited above the rejection is maintained.

Hence, Applicant's arguments do not distinguish the claimed invention over the prior art of record. In light of the foregoing arguments, the 102 rejections are sustained.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1 – 18, and 29 – 30 are rejected under 35 U.S.C. 102(e) as being anticipated by Lev Ran et al. ('Lev Ran' herein after) (US 2004/0255048 A1).

With respect to claim 1,

Lev Ran discloses a method for a storage operating system implemented in a storage system to concurrently perform readahead operations for a plurality of different read streams established in one or more files, directories, vdisks or luns stored in the storage system (paragraph 0412, Lev Ran), the method comprising:

- receiving a client read request at the storage system, the client read request indicating client-requested data for the storage operating system to retrieve from a file, directory, vdisk or lun stored in the storage system (paragraph 0328, Lev Ran);
- determining whether the received client read request matches any of a plurality of readset data structures ("readsets") allocated for the file, directory, vdisk or lun containing the client-requested data (paragraphs 0247 – 0248, Lev Ran); and
- performing readahead operations in accordance with a set of readahead metadata stored in a readset that is determined to match the received client read request (paragraphs 0296 – 0298, Lev Ran).

With respect to claim 2,

Lev Ran discloses the method of claim 1, further comprising:

- allocating at least one readset for each of the one or more files, directories, vdisks or luns in which the plurality of different read streams is established (paragraph 0008, Lev Ran);

- generating a separate set of readahead metadata for each of the plurality of different read streams (paragraph 0114 – 0116, Lev Ran); and
- storing each generated set of readahead metadata in a different readset allocated for the file, directory, vdisk or lun in which the read stream associated with the generated set of readahead metadata is established (paragraph 0220, Lev Ran).

With respect to claim 3,

Lev Ran discloses the method of claim 1, further comprising: initializing each allocated readset to store a predetermined set of values (paragraph 0191, Lev Ran).

With respect to claim 4,

Lev Ran discloses the method of claim 2, wherein the number of readsets allocated for a file, directory, vdisk or lun depends on the size of that file, directory, vdisk or lun (paragraphs 0167 and 0239, Lev Ran).

With respect to claim 5,

Lev Ran discloses the method of claim 4, wherein the number of readsets allocated for a file, directory, vdisk or lun is dynamically increased as the size of that file, directory, vdisk or lun is increased (paragraphs 0167 and 0239, Lev Ran).

With respect to claim 6,

Lev Ran discloses the method of claim 1, wherein a first readset is determined to match the received client read request if the first readset stores a set of readahead metadata associated with a read stream that is extended by the client-requested data (paragraphs 0247 – 0248, Lev Ran).

With respect to claim 7,

Lev Ran discloses the method of claim 1, wherein a second readset is determined to match the received client read request when the client-requested data is located within a predetermined fuzzy range associated with the second readset (paragraph 0191, Lev Ran).

With respect to claim 8,

Lev Ran discloses the method of claim 7, wherein the fuzzy range is derived based on a multiple of a number of client-requested data blocks specified in the received client read request (paragraph 0337, Lev Ran)..

With respect to claim 9,

Lev Ran discloses the method of claim 7, wherein the fuzzy range extends in both a forward direction and a backward direction in relation to a last data block retrieved in a read stream associated with the second readset (paragraphs 0191 – 193, Lev Ran).

With respect to claim 10,

Lev Ran discloses the method of claim 1, wherein a third readset is determined to match the received client read request if the third readset is determined to be unused (paragraph 0328, Lev Ran).

With respect to claim 11,

Lev Ran discloses the method of claim 10, wherein the third readset is determined to be unused when a level value stored in the third readset equals a special indicator value (paragraph 0220, Lev Ran).

With respect to claim 12,

Lev Ran discloses the method of claim 1, wherein readahead operations are not performed if the storage operating system determines that the file, directory, vdisk or lun containing the client-requested data is accessed using a random access style (paragraph 0362, Lev Ran).

With respect to claim 13,

Lev Ran discloses the method of claim 12, wherein a DAFS cache hint included in the received client read request indicates that the file, directory, vdisk or lun containing the client-requested data is accessed using a random access style (paragraphs 172 and 0362, Lev Ran).

With respect to claim 14,

Lev Ran discloses the method of claim 1, wherein readahead operations are not performed unless: (i) a readset is determined to match the received client read request (paragraphs 0247 – 0248, Lev Ran); and (ii) the matching readset stores a set of readahead metadata associated with a read stream that is extended by the client-requested data past a predetermined data block or memory address (paragraphs 0296 – 0298, Lev Ran).

With respect to claim 15,

Lev Ran discloses the method of claim 1, further comprising: if the received client read request does not match any of the readsets allocated for the file, directory, vdisk or lun containing the client-requested data, then performing the steps:

- identifying the received client read request as being the first read request in a new read stream (paragraphs 0247 – 0248, Lev Ran);
- generating a set of readahead metadata associated with the new read stream (paragraph 0114 – 0116, Lev Ran);
- selecting for reuse one of the readsets allocated for the file, directory, vdisk or lun containing the client-requested data (paragraphs 0167 and 0239, Lev Ran); and
- storing the generated set of readahead metadata associated with the new read stream in the readset selected for reuse (paragraph 431, Lev Ran).

With respect to claim 16,

Lev Ran discloses the method of claim 15, wherein the readset selected for reuse stores a level value that is less than or equal to level values stored in each of the other readsets associated with the file, directory, vdisk or lun containing the client-requested data (paragraph 519, Lev Ran).

With respect to claim 17,

Lev Ran discloses the method of claim 1, wherein the client read request received at the storage system is a file-based client read request (paragraph 237, Lev Ran).

With respect to claim 18,

Lev Ran discloses the method of claim 1, wherein the client read request received at the storage system is a block-based client read request (paragraph 407, Lev Ran).

With respect to claim 29,

Lev Ran discloses a storage system that employs a storage operating system to concurrently perform readahead operations for a plurality of different read streams established in one or more files, directories, vdisks or luns stored in the storage system, the method comprising:

- means for receiving a client read request at the storage system, the client read request indicating client-requested data for the storage operating system to retrieve from a file, directory, vdisk or lun stored in the storage system (paragraph 0328, Lev Ran);
- means for determining whether the received client read request matches any of a plurality of readset data structures ("readsets") allocated for the file, directory, vdisk or lun containing the client-requested data (paragraphs 0247 – 0248, Lev Ran); and
- means for performing readahead operations in accordance with a set of readahead metadata stored in a readset that is determined to match the received client read request (paragraphs 0296 – 0298, Lev Ran).

With respect to claim 30,

Lev Ran discloses a computer-readable media comprising instructions for execution in a processor for the practice of a method for a storage operating system implemented in a storage system to concurrently perform readahead operations for a plurality of different read streams established in one or more files, directories, vdisks or luns stored in the storage system, the method comprising:

- receiving a client read request at the storage system, the client read request indicating client-requested data for the storage operating system to retrieve from a file, directory, vdisk or lun stored in the storage system (paragraph 0328, Lev Ran);

- determining whether the received client read request matches any of a plurality of readset data structures ("readsets") allocated for the file, directory, vdisk or lun containing the client-requested data (paragraphs 0247 – 0248, Lev Ran); and
- performing readahead operations in accordance with a set of readahead metadata stored in a readset that is determined to match the received client read request (paragraphs 0296 – 0298, Lev Ran).

Conclusion

6. THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Navneet K. Ahluwalia whose telephone number is 571-272-5636.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alam T. Hosain can be reached on 571-272-3978. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Navneet

Navneet K. Ahluwalia
Examiner
Art Unit 2166

TM
3/28/07

Dated: 03/26/2007

HOSAIN ALAM
SUPERVISORY PATENT EXAMINER